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The Design and Development of the YOUTH@WORK game

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Abstract: Choosing a career is one of the most important decisions that a young person makes, and it is increasingly recognised that having a better understanding of careers and career management skills can help to improve the attainment of young people by reducing the risk of dropping out of school early and leading to more positive career outcomes. The Youth@Work game addresses this by supporting young people between the ages of 13-19 years in career planning. The main benefit of using a game-based approach in this area is that a game provides an active and engaging approach to supporting young people in making these complex and difficult decisions. The current paper describes a case study of the design and development of a game, the Youth@work game, to support career planning, from the initial ideas to the working game and explains how theories of theories of career development and choice were used to specify learning outcomes in the game. We will describe how the career competences required for the game were identified and operationalised and how these were implemented as learning outcomes in the game. The two main theoretical frameworks that were used to characterize the desired learning outcomes for the game were: (a) the Skills Development Scotland (SDS) model of career competences and (b) Holland's model of vocational interests. The SDS model provided a useful organisational framework for the game and both models helped to specify the varied activities in the different zones of the game. The scoring system and feedback are described as well as difficulties that emerged in game design and development as these can provide valuable lessons about general issues that arise in designing games for learning.

Keywords: game, careers, theoretical foundations, competence framework, vocational interests

1. Introduction

Choosing a career is one of the most important decisions that a young person makes about the direction that their life will take. It is increasingly recognised that having a better understanding of career management skills can help to improve the attainment of young people by reducing their risk of dropping out of school early and leading to more positive career outcomes (Skills Development Scotland, 2012). Current literature in career guidance and counselling discusses the importance of young people being more actively engaged in the career decision-making process (Lovén, 2003; Amundson, 2003), essentially moving from being passive receivers of career information and advice to active participants in their own career management (OECD, 2004; Watts, 2001).

It was within this context that the Youth@Work game was conceived. The game aimed to address this need for active involvement in career planning by supporting young people between the ages of 13-19 years in thinking

about themselves and the world of work and what they need to consider when thinking about themselves in relation to their future career. Games are increasingly recognised as providing active and engaging methods of learning which are congruent with modern theories that view effective learning as active, self-regulated, situated and constructive (de Corte, 2014).

The current paper describes the design and development of the Youth@Work game, from the initial ideas for the game to the final product. It explains how career theories were used to specify learning outcomes in the game and describes difficulties that emerged along the way.

2. Initial ideas for the game

While careers guidance experts found the idea of using a game to support career decision making very compelling, actually designing the game turned out to be a very difficult process. However a number of sources of information helped to guide our ideas about the game:

- Game design activities specified in the project proposal
- Existing models and frameworks of game design
- Career Experts' knowledge and understanding

2.1 Game design activities specified in the project proposal

The project proposal specified a literature review, a review of resources and an acceptability analysis and a user requirements analysis that were intended to assist in designing the game. The literature review reviewed materials and resources relevant to career guidance, especially electronic materials that had been evaluated in some way and reported in the literature, while the resource review focused on identifying existing materials that careers guidance practitioners use in their daily practice. Both found that ICT has been used to deliver information and conduct assessments related to careers, although career games were scarce. The literature review did identify a few papers about games for careers, going back as far as 1971, but relatively few high quality experimental evaluations of resources.

The perceived acceptability and user requirements analysis aimed to establish whether potential stakeholders viewed the game as providing a useful method for finding out about careers and what they would like to see in such a game. Generally both pupils and staff agreed that such a game would be useful in thinking about careers, although some were concerned that it is hard to combine the fun of games with careers. When asked what game features they would like to see in such a game, the top 10 rated features were: fun, competition, different levels, the ability to explore different environments, should be challenging, leader-board, compelling graphics, opportunity to discuss with friends, progress and tokens.

2.2 Existing models and frameworks of game design

Games for learning have a fairly short history and there is no commonly accepted and established method for designing games. There are however a number of models and frameworks of game design that aim to decompose the complexity of games, by identifying and organising the varied issues and components that need to be considered. These models provided another source of support in designing the game.

Garris et al. (2002) affirmed that, at that time, there was "little consensus regarding the essential characteristics of instructional games". They proposed an input, process, outcome game model which provided a very basic but useful understanding that in game design it is necessary to consider how the instructional content and game characteristics are integrated to create the game activities, which in turn lead to the learning outcomes.

de Freitas, Rebolledo-Mendez, Liarokapis, Magoulas and Poulouvassilis (2010) presented a four dimensional framework that proposed that in designing and evaluating games we need to look at aspects of the learners (such as challenge, conflict and progress), the representation, which is essentially the game (such as control, interaction, representation and location), pedagogy (such as assessment, feedback and debriefing) and the context of play (such as fantasy, rules, mystery, goals and objectives). While this model helps to provide some kind of structured analysis of components that need to be considered in designing a game, it still falls short of a comprehensive model for game design.

Reflecting Garris et al.'s claim that we need to consider how instructional content and game characteristics are integrated to create the game activities, Arnab et al. (2015) identified an ongoing problem in designing games as "the mismatch between game mechanics and educational components/aims". Arnab et al. presented a

framework describing how to map the desired learning in a game (learning outcomes) to the game mechanics (game outcomes). They proposed that Serious Game Mechanics (SGM) can be defined as “the design decision that concretely realises the transition of a learning practice/goal into a mechanical element of gameplay for the sole purpose of play and fun”. This model emphasises the need to clearly specify the desired learning outcomes and translate these into linked game activities and this provided useful guidance about the need to specify the desired learning outcomes for the game.

2.3 Career Experts’ knowledge and understanding

From the start the project partners had viewed the game as mirroring to some extent the activities carried out by careers guidance staff in their interactions with young people as they help them to manage their career development. As one careers guidance colleague put it “The game is trying to replicate what might happen in an interaction between a career advisor and a young person”, suggesting that the game is in some way a simulation game.

2.3.1 Theoretical frameworks

The most valuable source of information in specifying the learning outcomes for the game was the distillation of the theoretical knowledge and practical expertise of the careers guidance professionals. Many theories and frameworks underlie modern careers guidance practice but the two main theoretical frameworks that were used to characterize the desired learning outcomes for the game were: (a) the Skills Development Scotland (SDS) model of career competences and (b) Holland’s model of vocational interests.

2.3.2 Skills Development Scotland Competence framework

The first theory that was used in designing the game was the Skills Development Scotland (SDS) (2012) Career Management Skills Framework for Scotland. This framework provides a consistent definition of career management competences that young people need to be aware of in thinking about their careers, organised around four themes as defined below:

- Self: Competences that enable individuals to develop their sense of self within society.
- Strengths: Competences that enable individuals to acquire and build on their strengths and to pursue rewarding learning and work opportunities.
- Horizons: Competences that enable individuals to visualize, plan and achieve their aspirations throughout life.
- Networks: Competences that enable individuals to develop relationships and networks of support.

In the project proposal the game was described as a role playing game with a narrative of the player embarking on a career journey, where they had to tackle and complete certain activities in zones along the way. The SDS model seemed to provide an intuitive and useful framework for structuring the game into four zones, corresponding to these four different areas of competence, and also provided some indication of activities that might take place in these different zones. The four zones of the game corresponding to Self, Strength, Horizons and Networks were called Circus Cove, Tiny Town, Intercity and Networks. The final zone of the game, Crown Castle, was not part of the SDS competence framework, but was required to provide an interesting conclusion to the game where the player finds out which of the 36 careers he/she is most suited to.

2.3.3 Holland’s vocational interest model

The second major career theory that was used in the game development was Holland’s (1959) model of vocational interests. This theory is grounded in the study and measurement of individual differences, based on the premise that people who are able to choose an occupation that fits their interests and values (Dawis and Lofquist, 1984) will feel greater satisfaction and be more successful (Savickas & Baker, 2005). While this theory has a long history, it was popularised by Holland who argued that vocational interests can be categorised in terms of six main interest types: realistic (R), investigative (I), artistic (A), social (S), enterprising (E), and conventional (C). Interest inventories that measure these so-called RIASEC types have been developed and used extensively in career guidance and counselling (Savickas & Spokane, 1999; Tracey & Sodano, 2013). Matching individuals’ interests, abilities and attainments to possible careers has been a feature of many career interest guides including Kudos (www.cascaid.co.uk/kudos); My World of Work (<http://www.myworldofwork.co.uk/>) and ‘My Strengths’; Futurewise (www.myfuturewise.org.uk). Holland’s matching model also seemed to be consistent with the zones suggested by the SDS model, since Holland’s individual differences reflected the proposed self and strengths zones, while careers reflected the Horizons zone. Networks was less easy to merge with the model.

3. Bringing it all together to design the game

Career education is not always a part of the formal curriculum but the game is intended for both class activities and career guidance. In addition, while the game should extend players' knowledge about careers, an important aim is to help players find out more about themselves. Since everyone is different, there are no right or wrong answers.

In order to achieve the desired learning outcomes, the game included several game mechanics which have previously been reported to engage and support learning in games. These include a game narrative, meaningful choices of personal characteristics in the Self and Strengths zones, which feed into personalisation of the availability of subsequent information; card sorting and the creative exploration of careers in the Horizons zone; interactivity with non-player characters throughout the game, but especially in Networks, who help to guide and advise players; luck/chance in random advice presented Networks.

In the next section a short account of each zone of the game is provided describing the aims of the zone, the game context for each zone, what the player does in that zone and the learning outcomes. The helper in each zone who provides advice and guidance to the player about how to proceed in the game is also described.

3.1 Circus Cove, the Self zone

Activity in the Self zone, Circus Cove, takes place as players navigate their way through the Circus, where there are a number of activities, including a Ferris wheel and a mystic. The ringmaster helps the player to navigate their way through Circus Cove. The aims/learning outcomes for the 3 mini-games in Circus Cove are to help players think more explicitly about themselves with respect to (a) school subject preferences: players have to select 5 from 24 school subjects from a checklist format (b) leisure interests: players have to select 5 from 24 hobbies in the context of selecting balloons from a Ferris wheel and (c) career values: players enter a mystic's tent and they have to select 3 career values from 6 and place these in a pyramid in order of personal importance to them.

3.2 Tiny Town, the Strengths zone

Activity in the Strengths zone is situated in Tiny Town and the aims for the 2 mini-games in this zone are to help players think more explicitly about themselves with respect to their skills and personal qualities. The game context for the activities in Tiny Town is to provide the mayor with information that is required for completing the proper documentation for the visitor's book for admitting newcomers to Tiny Town and, once again, this is required for progress in the game. The mayor and his doppelganger assist the player in this process. The skills mini-game is a self-evaluation game where players are asked to rate themselves on a 1-5 scale on each of 15 skills. In the personal qualities mini-game, the player is presented with a checklist of 24 personal qualities and he/she selects the 5 that he/she feels best describe him.

3.2.1 Scoring

The main aim of the self and strength zones was to find out about the players in an unobtrusive way. While the first two zones of the game are pretty linear, in that all players have to play all games in a particular order, individual choices of leisure interests, subject preferences and personal qualities that players make during each mini-game introduce personalisation into the game and this impacts on subsequent game play. Choices are used to work out career category (RIASEC) preferences and these determine the careers that are available for players to explore in Intercity. This information is further used in Crown Castle, along with information about players' career values and skills ratings, to provide a "job compatibility" score for specific careers.

3.3 Intercity, the Horizons zone

In Intercity, the Horizons zone, the player moves onto the next phase of the game, where the aim is to extend the players' understanding of careers that they might be interested in pursuing in real life. The context of the games in Intercity is a career library where players have the opportunity to find out about 36 different careers by consulting career books. The librarian is the helper in Intercity and she helps the players to navigate their way through the different tasks that need to be carried out in exploring the career books. The 36 career books comprise six from each of the 6 RIASEC categories and the books are arranged in 6 shelves (rows) according to

their RIASEC category. The 2 mini-games in the horizons zone are (a) the library book sorting mini-game and (b) the career book exploration mini-game.

The aim of the library book sorting mini-game is to extend the player's knowledge that jobs differ with respect to certain characteristics. The context of this game is that some of the career books in the library have fallen off the shelves onto the floor and become muddled and the player's task is to sort them out. The jumbled pages address (a) the name of the job, (b) what is involved in the job and (c) the types of people who do this job. The player sorts out the books in batches of three. The books presented to each player come from the shelf of 6 books that represent the player's top ranked RIASEC category. The player implicitly learns about careers by sorting out the jumbled career books.

The career exploration mini-game is a simple exploration game, where the aim is to further extend the player's knowledge about careers that might be of interest to them. This game is also situated in the library where the player has the opportunity to explore specific career books in more depth. After playing one round of the library book sorting game, the player is granted access to explore the relevant library shelf from which the 3 books came, where he can now view all 6 career books relevant to his top ranked RIASEC category. He is now able to "open up" any of the career books on that shelf, where he can see information about that job presented in a book format. The information includes the name of the career, what the job involves, types of people who do this job, the 6 top areas of knowledge required for the job, the level of education required for the job, "if you like this you'll like that" information about other jobs that the player might like to explore out of the game and audio snippets providing short accounts of real people who are doing the job.

3.4 Networks

The aim of the Networks zone is to help players evaluate the quality of advice they are given about career decision making problems that they might encounter. The game context is a workshop where the player assists the Boss in making decisions about careers advice from different individuals. In the Networks game the player enters a room where he encounters 6 different career decision making scenarios and 4 different kinds of people who can provide them with advice about these issues: parents, careers advisor, teacher and a friend. Each advisor can offer good, poor or neutral advice about the problem. The player selects a problem scenario to explore and the advisor who they would like to seek advice from for that scenario. The game then randomly selects one of the 3 bits of advice from that advisor (good, bad or neutral) and the player's task is simply to decide whether this advice is helpful or unhelpful. The player is then given feedback which evaluates the player's response. For example if the scenario was: "Should I stay on at school or leave as soon as I can?" and the player selected "friend" as the person to whom he would go to seek advice, the friend's advice might be: 'But I am leaving this year, so you've got to leave too'. This is not really very useful advice so the player might response "not useful" and the game programme feedback would be "Your friend shouldn't really be making up your mind for you". Players are asked to consider 3 different scenarios and request advice for 2 different individuals.

3.5 Crown Castle

In the final zone of the game, Crown Castle, the player finds out which of the 36 careers he/she is most suited to. When players enter Crown Castle they have the opportunity to:

- Download their personal profile
- View the job advertisement board where
 - Job match compatibility score for any of the 8 jobs in Crown Castle
 - Feedback on RIASEC category, skills, attributes and qualifications

3.5.1 Download their personal profile

The player's personal profile shows them the track record of their responses in the game with respect to their top 2 RIASEC categories, their 5 subject preferences, 5 selected leisure interests, 3 career values, skills rated 4 or 5 and their top 5 personal qualities. The advantage of the personal profile is that the player can explicitly see a summary of their responses.

3.5.2 View the job advertisement board and see their job compatibility score

Players will then see a job advertisement board where they will see adverts for 8 jobs. The jobs are the 2 jobs they selected from (a) their top ranked RIASEC category, (b) their 2nd top ranked RIASEC category and (c) all 36 jobs and (d) 2 randomly selected jobs. Players can view the job adverts and then “apply” for a job to see their job compatibility score, a percentage matching score. This is based on matching the player’s RIASEC score (derived from their leisure interests, subject preferences and personal qualities), as well as their top 3 career values and skills ratings to the top 3 RIASEC categories, top 3 career values and 6 top skills for each job as described in O*Net (www.onetcenter.org). Players can see job their compatibility scores for all 8 jobs.

3.5.3 Feedback

When the player clicks on the progress bar next to their job compatibility score, they get feedback on how well they match the job they have applied for with respect to the RIASEC category for that job, their skills and their personal qualities. This feedback differs from the personal profile in that it is job specific.

4. Difficulties that emerged in game design and development

In this section difficulties that emerged in designing and developing the game are examined as these can provide valuable lessons about general difficulties with game design. The difficulties seemed to focus on a number of problems.

- Specification of learning outcomes for the game
- Hard and soft approaches to game design
- Linking career related information to game related information
- Coherent coordination of the game activities

3.6 Specification of learning outcomes for the game

The aim of the game as described in the original project proposal was to “provide young people with a more engaging way of tackling career planning and supporting career management skills”. Despite these clearly stated aims, it was very difficult to pin down exactly what the game should do. In retrospect it seems that the main problems were due to the intrinsically fuzzy and subjective nature of ideas about career management and planning. While there are many different career theories and practices, it was not immediately obvious what aspects of career decision making the game should focus on. The career experts had different ideas about how the game would look. In an attempt to resolve the uncertainty about the game, early in the project partners wrote “position papers” in an attempt to clarify some of these issues. These papers led to useful direction about the structure of the game, especially from the careers guidance partners who recommended the adoption of the two main theoretical perspectives in the game.

3.7 Hard and soft approaches to game design

Another difference that emerged between the content experts concerned whether the game should be a “hard” serious game based firmly on rigorous models of careers, such as the American specification of jobs described in O*Net, or whether the game should have a “softer”, less rigorous, but more “gamey” feel. This difference was evident in using the questionnaires in the self and strengths zones. There are advantages and disadvantages of both of these approaches. The advantage of the hard approach is that it ensures that the game is rigorously based in theory. Since the game was going to make suggestions to players about which career categories and careers may be most suitable for them, a hard approach would be more likely to ensure the validity of these recommendations. The technical partners were more in favour of the “hard” solution since it would be easier to program. The advantage of the softer approach is that it could make the game more appealing to players. To some extent a compromise was reached whereby the game was built strongly on theory, but many of the theoretical terms were “translated” into more user friendly language.

3.8 Linking career related information to game related information

While there are suggestions for learning mechanics for games at a number of different levels (Sicart, 2008), there is no definitive mapping of learning content to game outcomes. This results in a somewhat ad hoc and experimental approach to devising game mechanics to support learning outcomes. The project addressed this by trying to rigorously define the learning outcomes for the game overall and for each section of the game. An interesting problem that emerged was that the data collected in the self and strengths zones was essentially

derived from questionnaires and this led to the question of how best to gamify questionnaires. Essentially the logic of these tasks was to find a way of gamifying a task where the player was required to select from a set number of alternatives the small number of characteristics that best described him. The balloon popping game and the Values pyramid were two mechanisms that were chosen to represent this from a number of suggestions.

3.9 Coherent coordination of the game activities

In addition to the challenges of specifying the learning outcomes for the different zones of the game, it was also tricky to specify the connections between the different zones and how players would progress from one zone to the next in a sensible way. This seemed to be largely due to the fact that connections between the self, strengths, horizons and networks competences in the SDS model had not previously been spelled out. The underlying game narrative of the game of the young person on a career journey helped to address this issue, along with the matching idea of person environment fit theories underpinning conventional positivist career choice theories.

4. Conclusion

Designing the Youth@work game from scratch was not straightforward and required the coordination of information from a number of different sources in a short period of time. Careful consideration of two career theories was especially helped in specifying the learning outcomes of the game, with the SDS model of career competences providing guidance about the organisation of the game and the different zones, while Holland's model of vocational interests helped to specify activities for the different zones. Game mechanics including narrative, personalised choice, interaction, progression and scoring are described as well as difficulties that emerged in game design and development as these can provide valuable lessons about general difficulties with game design.

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